The 25th Army Science Conference (ASC) — Charting the Future of S&T for the Soldier

Dr. John A. Parmentola and Robert Khan

The ASC, sponsored by the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT), has been held every 2 years since it's inception in 1957. In his keynote address to attendees at the first ASC, U.S. Army Chief of Research and Development LTG James Gavin said, "I am delighted to see a meeting here. I would sooner see a meeting of the scientists than our top military people here because we want ideas, we need your assistance. We're dealing with an exceedingly difficult problem in a dynamic period of our Nation's history. We need your help in every way possible for you to give it to us."

The U.S. Army Research Laboratory's John Hopkins (left) talks about the PackBot fuel cell and battery with Claude M. Bolton Jr. (middle), AAE/ASAALT, and John J. Young (right), Director, Defense Research and Engineering, Office of the Secretary of Defense (OSD), at the 25th ASC.

* U.S. Army photos by Richard Mattox, Program Executive Office Enterprise Information Systems.

The 25th ASC was held in Orlando, FL, on Nov. 27-30, 2006. This prestigious event celebrated 50 years of Army sponsorship of innovative science and technology (S&T) for our Soldiers and marked a significant milestone for the Army S&T community. In his letter to 25th ASC attendees, U.S. Army Vice Chief of Staff GEN Richard A. Cody echoed Gavin's words from the first ASC. "Our emerging technological innovations must provide the strategic advantages our Soldiers need to always stay one step ahead in today's dangerous environment. The Army is looking to its scientists and engineers to continue to direct their talents and energies in support of the Soldier," wrote Cody.

The 25th ASC

The ASC follows in a long tradition of essential scientific activities that are needed to further scientific investigation and inquiry. The ASC focuses entirely on research that is relevant to the Army and its mission. It brings Army scientists and engineers together with those from academia, industry, other government agencies and our foreign partners who are focused on Army issues. It is a unique forum, where scientists and engineers concerned with addressing Army challenges from anywhere in the world, can openly and freely discuss the latest advances in research covering 16 disciplines relevant to the Army mission. The conference also:

- Addresses the latest ideas being proposed by world leaders in their research fields.
- Initiates new partnerships and collaborations through the exchange of ideas.
- Allows attendees to acquire new knowledge through dialogue and discussion.
- Enables young Army researchers to grow personally and professionally by engaging world leaders in their fields of research relevant to the Army.
- Enables scientists and engineers to present their latest research results to the world community working on Army problems.

The major product that results from this forum is a peer-reviewed *Conference Proceedings*, which contains more than 80 seminal papers of high quality and relevance to the Army mission. These 80 papers were selected from a peer review of more than 900 submittals. The *Conference Proceedings* package is distributed to major libraries worldwide and serves as an official reference for those who contributed original research papers to this prestigious and highly

Dr. John Parmentola, Director of Research and Laboratory Management, Office of the Deputy Assistant Secretary of the Army for Research and Technology, was master of ceremonies for the 25th ASC in Orlando.

relevant publication. In addition, there are collaborations, partnerships, new ideas and the expansion of human networks to further advance Army S&T. The ASC communicates the Army vision to a very broad world community as well as to Congress, which ultimately decides on the Army S&T budget annually. There is no other opportunity for Congress or, for that matter, anyone else to experience the breadth and depth of the Army's S&T program other than through the ASC. In this sense, the ASC is critical to the Army so long as S&T is required to fulfill the Army's mission now and in the future.

Since its inception, the ASC has grown from a small gathering of Army scientists and engineers to an international event attended by more than 1,600 people from 30 different nations. Authors of the most outstanding technical papers presented at the conference receive special recognition and awards. In addition, an *International Collaboration Award* was inaugurated at the 25th ASC to recognize contributions from the world community that have significant potential for benefiting our Soldiers.

Theme and Exhibits

The theme for the 25th ASC, *Transformational Army Science & Technology — Charting the Future of S&T for the Soldier*, emphasized the S&T community's importance in providing leading-edge capabilities for Soldiers now and in the future. An acknowledgement of the past, recognition of the impressive accomplishments of the present and enthusiasm for the future was evident throughout the conference. More than 70 exhibitors from the Army, industry, academia and international partners presented major innovations at the S&T showcase that featured S&T advancements that are having, or will have, impacts on warfighting capabilities.

At various locations throughout the S&T showcase were focus areas devoted to key capabilities that enable the Army to carry out its mission to shoot, move, communicate, sense, protect and train. The technologies and systems displayed within these focus areas date back from the first ASC in 1957, to the modern day systems used in Iraq and to products being developed for the Future Combat Systems (FCS) and Future Force. As an example of the dramatic advancements that have occurred over this period, visitors were able to compare a Sherman Tank, a current-day Stryker and an Unmanned Ground Combat Vehicle with FCS application.

John J. Young, Director, Defense Research and Engineering, OSD, addresses the 25th ASC's participants about the government's refined contract award processes.

Speakers

The 25th ASC also featured 24 speeches and presentations by DOD and Army leadership, international defense S&T community leaders, Army and U.S. Marine Corps (USMC) warfighters and eminent scientists — including seven Nobel Prize winners, strategic thinkers and futurists, and those promoting education in mathematics, science and engineering for our Nation's youth. You can see and hear the guest speakers' 25th ASC speeches and presentations by accessing the Defense Acquisition Web site at **http://view.dau.mil/ dauvideo/view/channel.jhtml?stationID=1994197044**.

In this article, we present highlights of some of the conference's presentations. Dr. John Parmentola, the Army's Director of Research and Laboratory Management and the ASC's lead organizer and moderator, introduced Army Acquisition Executive (AAE)/ASAALT Claude M. Bolton Jr., sponsor and host for the 25th ASC. Bolton welcomed the audience and spoke briefly about capabilities that the Army S&T community is working on in various technical areas. He noted that the greatest challenge facing the Army is recruiting and retaining qualified people. Bolton stated, "Everything we do in the Army starts with people, and we as a Nation are not producing enough qualified people to meet existing requirements." Professor Colin Gray, the Chair in International

Politics and Strategic Studies at the University of Reading in the United Kingdom (U.K.) and, at times, an advisor to the U.S. government, presented a strategic look at security threats in the 21st century. LTG Paul Van Riper (USMC, Ret.) eloquently and lucidly presented his views on future warfighting capabilities necessary to succeed in the future environment that Gray described.

Claude M. Bolton Jr., AAE/ASAALT and ASC host, addresses several of the Army's most notable S&T accomplishments, including the ongoing FCS program, the largest and most complex effort the Army has ever undertaken.

The Army has sponsored 30 eminent scientists who have won Nobel Prizes. Seven of the Army-sponsored Nobel Laureates accepted invitations to speak at the 25th ASC. (See related story titled *Wise and Witty – Seven Nobel Laureates Address 25th Army Science Conference* on Page 76 of this issue.)

Dr. Leroy Hood, President of the Institute for Systems Biology in Seattle, WA, gave the audience a fantastic glimpse into the future of medicine, where the analysis of a drop of blood taken from someone remotely and analyzed will enable a timely diagnosis of that person's state of health.

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Awards

Authors of the most outstanding papers in each of 16 technical categories received *Best Paper Awards* at the closing banquet. Three of the 16 Best Papers were further selected as the highest quality research efforts presented at the conference. Author(s) of the overall best paper received the *Paul A. Siple Memorial Award*, while authors of the two next best papers received bronze medallions.

The *International Collaboration Award* was presented to those authors whose work was selected by a panel of scientific peers and deemed to be the most outstanding collaborative research effort between U.S. Army and foreign scientists that expanded and enhanced the Army's research and technology program while benefiting the scientific interests of the collaborating foreign scientists.

The list of oral paper presenters included seven Junior Science and Humanities Symposium winners from 2005 and 2006. Papers presented by these students will be included with 80 other papers from authors in government, academia, industry and foreign nations that will be published in the *25th ASC Proceedings*.

Additionally, a group of eCYBERMISSION winners from the local area toured the S&T Showcase. Winners of the *2005* and *2006 Research and Development Awards* were also recognized at the conference.

Best Paper Awards

International Collaboration Award winners were: Dr. Dirk R. Klose, Dr. Israel Mayk, Anthony Tom, Andrew Chan, Mike Mai, Gunther Kainz, Joseph Hnat and Bernard Gore (Software Design) from the U.S.; Heinz-Bernd Lotz, Alfred Pfaendner and Hans-Peter Menzler from Germany; Cyrus Aiken, David Bryant and LTC James Derosenroll from Canada; Herve LeGoeff, Lionel Khimeche and LTC Patrick Bezombes from France; LTC Dror Schwartz, LTC Amir Ziv and LTC Ehud Kauf from Israel, for their paper titled *Simulation and C2 Information Systems Connectivity Experimentation (SINCE) Project*.

The 25th ASC *Paul A. Siple Memorial Award* winners were: Dr. Dattatraya Dandekar, Dr. James W. McCauley and W.H. Green from the U.S. Army Research Laboratory (ARL); Dr. Neil K. Bourne from the University of

GEN Benjamin S. Griffin, U.S. Army Materiel Command (AMC) Commanding General, discusses AMC's numerous S&T contributions to both the Army and the Joint community.

Dr. Thomas Killion, Deputy Assistant Secretary of the Army for Research and Technology and the Army's Chief Scientist, highlighted some of the latest technologies Army S&T is working on, including avatars that allow human to virtual human interaction.

Manchester, U.K.; Dr. Mingwei Chen from Johns Hopkins University and Tohoku University of Sendai, Japan, for their paper titled *Global Mechanical Response and its Relation to Deformation and Failure Modes at Various Length Scales under Shock Impact in Alumina AD995 Armor*. This paper was also selected as the best paper in the Advanced Materials and Manufacturing Technology technical category.

The first bronze medallion was awarded to Dr. Matthew Spenko of Stanford University, Dr. Karl Iagnemma of the Massachusetts Institute of Technology (MIT) and Dr. Jim Overholt of the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC), for their paper on *High Speed Hazard Avoidance for Unmanned Ground Vehicles in Emergency Situations*. This paper was selected the best paper in the Unmanned Systems technical category.

The second bronze medallion went to Dr. Bradley W. Schilling, Dr. Stephen Chinn, Dr. Lew Goldberg, Dr. Alan D. Hays and Dr. C. Ward Trussell from the U.S. Army Communications-Electronics Research, Development and Engineering Center (CERDEC), for their paper titled *End-Pumped Monoblock Laser for Eyesafe Targeting Systems*. This paper was selected the best paper in the Sensors and Information Systems technical category.

Best paper awardees in the 13 other technical categories were:

- Dr. Kamal Sarabandi from the University of Michigan and George Palafox of CERDEC, for their paper *Reducing Antenna Visual Signature Using Meta-Materials*, in the Information Technology/Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance category.

Dr. Roger Lough, Chief Defence Scientist, Defence Science and Technology Organisation, Department of Defence, Australia, explained that his country's S&T endeavors include quantitative analysis, strategic analysis, advanced engineering and support.

- Dr. Raul Radovitzky, Dr. Zisu Zhao and Dr. Ludovic Noels of MIT; and Dr. Sean Mauch of the California Institute of Technology, for their paper titled *Lagrangian Simulation of Penetration Environments via Mesh Healing and Adaptive Optimization*, in the Advanced High Performance Computing in Physical Sciences and Engineering category.
- Professor Michael Hinton, Dr. T. Andrews, Dr. Philip Church, Dr. Ian Cullis, Dr. Steven Gilbert, Dr. Michael Hamblin and Dr. David Porter of QinetiQ Co.; Dr. B. Proud of Cambridge University; and Dr. A. Pullen of the Imperial College, all in the U.K., for their paper titled *Penetrating Buildings in Urban Operations - Towards Weapons Design by Simulation*, in the Lethality Technologies category.
- Dr. Parimal Patel, Gary Gilde and Dr. Alex Hsieh of ARL for their paper titled *Improved Low-Cost Multi-hit Transparent Armor*, in the Force Protection/Survivability category.
- Dr. Peter Schihl, Dr. Walter Bryzik, Laura Hoogterp, Harold Pangilinan and Ernest Schwarz of TARDEC for their paper titled *Modeling JP-8 Fuel Effects on Diesel Combustion Systems*, in the Power and Energy category.
- Susan Robinson, Antonio Roque, Dr. David Traum and Ashish Vaswani of the University of Southern California (USC) Institute for Creative Technologies; Charles Hernandez of ARL; and Bill Millspaugh of Tec-Masters Inc., for their paper titled *Evaluation of a Spoken Dialogue System for Virtual Reality Call*

U.K. Ministry of Defence Director General (Research & Technology) Phil Sutton addresses the 25th ASC concerning potential security threats and what the scientific community is doing to abate them.

Retired USMC LTG Paul Van Riper strongly advised the S&T community to study the new counterinsurgency field manual about to be issued to find ways it can support warfighters and defeat worldwide terrorism.

for Fire Training, in the Immersive Technology category.

- Dr. Peter Tikuisis of Defence Research and Development Canada for his paper titled *Target Detection, Identification, and Marksmanship Under Various Types of Physiological Strain*, in the Behavioral Sciences and Human Performance category.
- Dr. Xiugong Gao and Dr. Prabhati Ray of the Walter Reed Army Institute of Research, Dr. Radharaman Ray of the U.S. Army Medical Research Institute of Chemical Defense, and Dr. Peter Barker and Dr. Yan Xiao of the National Institute of Standards and Technology, for their paper titled *Anti-Cytotoxic and Anti-inflammatory Effects of the Macrolide Antibiotic Roxithromycin in Sulfur Mustard-Exposed Human Airway Epithelial Cells*, in the Biomedical Technologies category.
- Dr. Kevin O'Connell and Dr. Evan Skowronski of the U.S. Army Edgewood Chemical Biological Center, Jonathan Leshin and Dr. Kenneth L. Dretchen of Georgetown University and Dr. Andrea Weeks of George Mason University, for their paper titled *Discovery and Characterization of Novel Signatures from the Ricinus Communis (castor bean) Genome*, in the Biotechnology category.
- Dr. Shubhra Gangopadhyay, Steven Apperson, Dr. Keshab Gangopadhyay, S. Subramanian, Dr. Shameem Hasan and Dr. Rajesh Shende of the University of Missouri-Columbia; and Dr. Deepak Kapoor, Steve Nicolich and Paul Redner of the U.S. Army Armament Research, Development and Engineering Center (ARDEC), for their paper titled *Novel Nanostructured Energetic Materials*, in the Nanotechnology category.
- Dr. Manijeh Razeghi, H. Lim, Dr. Alan A. Quivy, M. Taguchi, S. Tsao and W. Zhang of Northwestern University's Center for Quantum Devices, for their paper titled *Infrared Imaging With Self-Assembled InGaAs Quantum Dot Infrared Photodetectors*, in the Microelectronics and Photonics Technology category.

According to Dr. Colin Gray, Chair, International Politics and Strategic Studies, the University of Reading, U.K., the security threats we face in the 21st century are a return of a great power conflict, climate change, uneven development in the world, overpopulation, resource shortages, nuclear wars and terrorism.

- Dr. Mohammad Qasim and Dr. Leonid Gorb of ARDEC; Dr. Jerzy Leszczynski of Jackson State University's Computational Center for Molecular Structure and Interactions; and Particia Honea of the University of Mississippi Medical School, for their paper titled *Molecular Structure Determines Chemical Reactivities and, thus, Transformation Pathways*, in the Environmental and Engineering Geosciences category.
- Dr. Latha Kant, Dr. Farooq Anjum and Dr. Kenneth Young of Telcordia Technologies, for their paper titled *Design & Analysis of Scalable Network-Centric Warfare Mechanisms*, in the Advanced Modeling and Simulation category.

Conference survey results and numerous remarks by attendees indicated that an overwhelming majority found that the information and opportunities presented during the conference were very beneficial and that the 25th ASC was the best ever. The conference enabled the Army S&T community to engage a very broad audience on the S&T challenges underpinning Army transformation to the Future Force. Many presentations were once-in-a-lifetime opportunities to hear extraordinary individuals expound on their own research and unique insights into the future of S&T. The collaborations and partnerships formed and information exchanged at the conference will undoubtedly reap numerous and unimaginable dividends in the future.

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